DIRECT TESTIMONY OF

JOHN H. RAFTERY

ON BEHALF OF

SOUTH CAROLINA ELECTRIC & GAS COMPANY

DOCKET NO. 2019-2-E

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS, AND OCCUPATION.

A. My name is John Raftery. My business address is 220 Operation Way, Cayce, South Carolina. I am General Manager of Renewable Products/Services and Energy Demand Management for South Carolina Electric & Gas Company ("SCE&G" or the "Company").

Q. STATE BRIEFLY YOUR EDUCATION, BACKGROUND, AND EXPERIENCE.

A. I am a graduate of Northwestern University with a Bachelor of Science degree in Mechanical Engineering. I began my public utilities career in 1994 as an Information Technology Management Consultant with Price Waterhouse and continued with Oracle Corporation in 1998. I joined SCANA Corporation in 2003 as a Client Manager in the Customer Systems Support Organization and gained the responsibilities of the Customer Service Training Department several years later. In 2010, I assumed responsibility for the SCANA Contact Centers and Technology

Services, with the addition of SCE&G's Business Offices in 2013. In 2014, I assumed my current role as General Manager of Renewable Products/Services and Energy Demand Management.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. The purpose of my testimony is to discuss the performance and costs associated with SCE&G's Distributed Energy Resources ("DER") programs during the review period of January 1, 2018, through December 31, 2018 ("Review Period"), and provide the DER program cost projections for the forecast period January 1, 2019, through April 30, 2020 ("Forecast Period"). I also discuss the anticipated progress towards the 2% capacity cap for Net Energy Metering ("NEM") and the Company's communications plans to customers and solar installers once the 2% cap is reached; the Company's application of variable integration charges to solar developers; and the Company's continued evaluation and plans to issue Requests for Proposals ("RFPs") to invest in DER facilities pursuant to S.C. Code Ann. § 58-39-130(D).

Q. UNDER WHAT AUTHORITY DID THE COMPANY IMPLEMENT DER PROGRAMS?

A. In Docket No. 2015-54-E, the Company sought authorization of the Commission to participate in a DER program under the South Carolina Distributed Energy Resource Act ("Act 236"). In Order No. 2015-512, the Commission granted

the Company's petition and concluded that SCE&G's proposed DER Programs, as modified by the Settlement Agreement entered into by the parties of record to that proceeding, were reasonable and prudent. In approving the Settlement Agreement, the Commission also determined that these programs would result in the development of approximately 42 megawatts ("MW") of renewable energy facilities sized between one and ten MW ("Utility-scale") and approximately 42 MW of renewable energy facilities sized less than one MW ("Customer-scale"). The Company subsequently implemented its first DER programs on October 7, 2015, with retroactive sign-up availability to those customer installations after January 1, 2015, if they so chose.

DER PROGRAM COSTS

Q. PLEASE DESCRIBE THE DER PROGRAM COSTS THAT WERE INCURRED BY SCE&G DURING THE REVIEW PERIOD AND THAT THE COMPANY PROJECTS TO INCUR DURING THE FORECAST PERIOD.

A. During the Review Period, the Company offered customers a variety of solar programs approved by the Commission in Order No. 2015-512, including the interconnection of the first 14 MW of the 16 MW Community Solar DER program's total capacity. As a result of these efforts, the balance of DER program costs at the end of the Review Period totaled ($1,856,462) in avoided costs and $669,089 in incremental costs. For the period January 1, 2019, through April 30, 2020, the

Company projects that DER Program costs will include $9,426,377 in avoided costs and $25,558,588 in incremental costs.

Q. WHAT ARE AVOIDED AND INCREMENTAL COSTS?

A. Section 58-39-120(B) defines "avoided costs" as meaning "payments for purchases of electricity made according to an electrical utility's most recently approved or established avoided cost rates in this State or rates negotiated pursuant to PURPA, in the year the costs are incurred, for purchases of electricity from qualifying facilities pursuant to Section 210 of [PURPA]…." "Incremental costs" are defined by S.C. Code Ann. § 58-39-140(A) as meaning "all reasonable and prudent costs incurred by an electrical utility to implement a distributed energy resource program … including, but not limited to:

(1) The cost an electrical utility incurs in excess of the electrical utility's avoided cost rate …;

(2) The full cost of an electrical utility's investment in nongenerating distributed energy resources …;

(3) The electrical utility's weighted average cost of capital as applied to the electrical utility's investment in distributed energy resources …;

(4) Operating and maintenance expenses, taxes, insurance, depreciation, overheads, and all other expenses properly considered to be expenses associated with a project, asset, or program under generally accepted

principles of regulatory, or utility accounting or accounting orders issued by the commission …; [and]

(5) The electrical utility's incremental labor cost associated with implementing a distributed energy resource program."

Q. WHAT DO THESE COSTS INCLUDE?

A. These costs include the avoided and incremental costs associated with SCE&G's approved DER programs, including 1) offering Utility-scale DER programs; 2) offering Customer-scale NEM incentives, Performance Based Incentives and Bill Credit Agreement programs; and 3) offering the Company's Community Solar program. These costs also include general and administrative expenses directly resulting from offering DER programs to the Company's customers, such as information technology system enhancements, revenue-grade meters, marketing and education expenses, and the incremental labor required to support the programs and increased volume of customer inquiries. Company Witness Allen Rooks provides these cost components in his testimony.

UTILITY-SCALE DER PROGRAMS

Q. PLEASE UPDATE THE COMMISSION ON THE COMPANY'S PROGRESS TOWARD MEETING ITS UTILITY-SCALE DER GOALS AS OF THE END OF THE REVIEW PERIOD.

A. During its prior fuel proceeding, SCE&G reported that, as of December 31, 2017, nine solar farms totaling 48.16 MW had been constructed and interconnected to SCE&G's distribution system as part of the Company's approved DER program. As such, SCE&G has achieved the 1% goal for Utility-scale facilities set forth in Act 236.

CUSTOMER-SCALE DER PROGRAMS

Q. PLEASE UPDATE THE COMMISSION ON THE COMPANY'S PROGRESS TOWARD MEETING ITS CUSTOMER-SCALE DER GOALS AS OF THE END OF THE REVIEW PERIOD.

A. To accomplish its Customer-scale DER goals, SCE&G offers its residential and non-residential customers a new retail net energy metering program ("NEM 2.0"), through which customers receive bills that are equivalent to bills that the customers would have had if the customers received a credit for each kilowatt-hour ("kWh") generated by their renewable resources that is equal to the price that is charged per kWh for the energy consumed. The difference between the value of net metered customer generation, as determined using the methodology approved in

Docket No. 2014-246-E, and the customer's retail rate is recoverable as a DER incentive.

As of December 31, 2018, 8,774 SCE&G customers (8,688 residential and 86 non-residential) were participating in the Company's NEM 2.0, as compared to 6,075 participating customers as of December 31, 2017. Participation in NEM 2.0 accounts for approximately 67.85 MW of solar generating capacity (approximately 62.25 MW from residential and approximately 5.60 MW from non-residential) on SCE&G's system.

For residential customers participating in NEM 2.0, the Company also offered the opportunity to reserve—on a first-come, first-serve basis for up to a cumulative total of 9 MW of reserved capacity—a Performance Based Incentive ("PBI"). The available PBIs were fully reserved, and as of December 31, 2018, 1,072 of the NEM 2.0 residential customers (included in the residential customer count above) with generating capacity totaling approximately 8.00 MW (included in the generating capacity total above) were receiving the PBI. The remaining reservations have expired.

As an alternative to NEM 2.0, SCE&G also offers its non-residential customers the opportunity to participate in its Bill Credit Agreement ("BCA") program in which all energy produced by the customer's generator is delivered to the SCE&G electrical system, and the customer is compensated at tiered, incentivized rates directly on the customer's SCE&G bill. As of December 31, 2018, SCE&G had 109 BCA customers totaling 19.23 MW in generating capacity.

By Order No. 2017-246, the BCA program was indefinitely suspended to systems without approved applications and interconnection agreements by April 27, 2017.

In sum, as of December 31, 2018, SCE&G had 8,883 customers (8,688 residential and 195 non-residential) participating in its Customer-scale DER programs. This customer participation represented approximately 87.08 MW of solar generating capacity on SCE&G's system. As such, SCE&G has achieved the 1% goal for Customer-scale facilities set forth in Act 236.

Q. WHAT WAS THE TOTAL CUMULATIVE NEM GENERATING CAPACITY ON SCE&G'S SYSTEM AS OF DECEMBER 31, 2018?

A. As of December 31, 2018, the total cumulative NEM generating capacity provided by the 8,997 net metering customer-generator facilities on SCE&G's system was approximately 68.89 MW, or approximately 1.63% of the Company's five-year average peak demand of 4,225 MW set forth in Commission Order No. 2015-512. Of this total, approximately 1.03 MW of solar generating capacity comes from the 223 "NEM 1.0" participants, who have elected to remain on the net metering tariff in effect at the time NEM 2.0 was approved. Pursuant to S.C. Code Ann. § 58-40-20(A), these NEM 1.0 customers can remain on this rate schedule through December 31, 2020, after which time the NEM 1.0 rate will close and they will be required to move to any available rate schedule for which they qualify.

Q. WHEN DOES SCE&G ANTICIPATE MEETING ACT 236'S NET METERING LIMIT OR CAP OF 2%?

A. Based on NEM adoption levels and trends experienced over the past two years SCE&G presently forecasts that it will approach the 2% cap in April 2019. This estimate encompasses not only the amount of interconnected NEM expected at that time, but also the amount of applications that will have been approved to be built as well as those to be submitted for approval.

Pursuant to the Settlement Agreement in Docket No. 2016-246-E, SCE&G will file new net metering tariffs to replace the existing tariffs no later than January 31, 2020.

Q. HOW DOES SCE&G PLAN TO COMMUNICATE TO CUSTOMERS AND INSTALLERS AS THE 2% NEM CAP IS REACHED?

A. SCE&G has developed a communications plan in which notices will be sent to users of its online application system supporting systems less than 20 kW in size ("PowerClerk"), individuals that have previously submitted interconnection applications to SCE&G Transmission Services greater than 20 kW in size, and its DER Advisory Group established in Order No. 2015-512. These notices will include the anticipated dates in which NEM applications will need to be submitted, fully completed and approved in order to guarantee participation in the NEM program. In addition, both SCE&G's traditional website as well as its PowerClerk

application will be updated with pertinent information on the NEM Cap schedule. These efforts are expected to be completed by the end of February 2019.

Q. PLEASE FURTHER DISCUSS THE FORECASTED NEM CAP SCHEDULE AND THE PROCESSING OF APPLICATIONS.

A. Through experience, SCE&G has determined that not all submitted and/or approved applications ultimately are built. As such, it is impossible to accurately forecast and approve the single, final application that marks the achievement of the NEM Cap. Similar to its closure of the Net Energy Metering Performance Based Incentive and the Bill Credit Agreement Programs, SCE&G supports accepting and approving applications with a date certain after the expected milestone is to be reached. This permits a limited amount of applications above the 2% NEM Cap to be submitted (estimated 1,758 kW for a month) while simplifying customer and installer communications.

Provided that the current trend supports meeting the NEM Cap in early April 2019, SCE&G will accept submitted applications through May 3, 2019. Those submitted applications must then be determined to be fully complete, including all paperwork and application fees submitted, within 15 business days (May 24, 2019). All applications would be provided an additional 45 business days to successfully pass through the technical review and approval processes (July 26, 2019). All approved systems must be interconnected within one year of their approval.

Q. WHAT SOLAR PROGRAMS WILL BE AVAILABLE TO CUSTOMERS AFTER THE 2% NEM CAP IS REACHED?

A. It is important to note that SCE&G does not have a cap on solar. Rather there is only a cap on NEM systems to limit the cost shifts created for non-solar customers by this billing mechanism. SCE&G offers customers interested in solar a number of different programs in which they may voluntarily participate; each of these programs is designed to hold non-participants harmless.

Specifically, SCE&G offers two programs for customers to sell their renewable energy production directly to SCE&G. The first program is for qualifying facilities less than or equal to 100 kW and represented under "Rate PR-1 Small Power Production, Cogeneration." The second program is for qualifying facilities greater than 100 kW and less than or equal to 80 MW. This program is represented under "Rate PR-2 Solar Power Production." Both programs are modeled under PURPA avoided costs.

Customers interested in solar facilities to be interconnected behind SCE&G's meter may continue to do so at this time. They will naturally offset part of their home's load by consuming solar power production directly onsite. Should any excess solar power be supplied by their system and not used onsite, this exported energy will be metered and paid at the corresponding PR-1 or PR-2 rate schedule.

Finally, although it is currently fully subscribed, SCE&G maintains a waitlist of interested Residential customers that wish to participate in its Community Solar

Program. As customers move out of the service territory, certain capacity is made available to new customers.

COMMUNITY SOLAR

Q. PLEASE UPDATE THE COMMISSION ON THE PROGRESS OF SCE&G'S COMMUNITY SOLAR PROGRAM.

A. By Order No. 2016-707, the Commission approved the Credit Rate Agreement between SCE&G and Clean Energy Collective, LLC ("CEC") whereby CEC is authorized to develop, build and market up to 16 MW of community solar renewable generating facilities. The individual solar panels in these facilities are available for SCE&G customers to either purchase or subscribe to their energy output as a credit on their SCE&G bills.

Springfield Solar, a 6 MW facility in Orangeburg County, and Nimitz Solar, an 8 MW facility in Jasper County, entered commercial operation in June 2018. CEC continues construction on Curie Solar, a 2 MW facility in Hampton County, with a targeted operations date of February 2019.

As of December 31, 2018, the following number of customer accounts and associated MW of capacity have either been purchased or subscribed to in the three community solar facilities. The remaining 0.022 MW of capacity is reserved for Low-Income customers and is filled via a separate waitlist of Low-Income customers created by the marketing of SCE&G, CEC and 8 Community Assistance Agencies.

Segment	Accounts	Capacity (MW)
Low-Income	160	0.978
Residential	902	5.564
Church, School, Municipal	34	9.436
Total	1,096	15.978

VARIABLE INTEGRATION CHARGES

Q. PLEASE BRIEFLY DISCUSS VARIABLE INTEGRATION COSTS.

A. As described in detail in the Direct Testimony of Company Witness Dr. Matthew Tanner's, intermittent solar impacts SCE&G's electrical system in a number of ways, including operating reserves and plant cycling. Intermittent solar causes the need for SCE&G to maintain additional reserves, forcing it to operate its plants at less than the most efficient levels for which they were designed, requiring it to start and stop plants more frequently whereby extra start-up fuel is incurred, as well as the added operations and maintenance expense experienced in the cycling of those plants. These are some of the examples collectively known as variable integration costs and result in increased SCE&G system expenses in order to maintain reliable electric service for the Company's customers, while solar generators remain online producing energy or none at all.

Q. WHO IS RESPONSIBLE FOR THE RECOVERY OF THESE COSTS?

A. For over 700 MW of the approximately 1,048 MW of solar generation with an executed power purchase agreement ("PPA"), the executed PPA specifically

provides that the solar owner/developer ("Seller") is responsible for the variable integration costs. This protects ratepayers from any costs which may otherwise be borne by them, but are actually attributable to the Seller's solar projects. Were it not for these solar generators on SCE&G's system, the Company would not be incurring the added costs.

Specifically, the applicable provision of the mutually executed PPA reads:

> (b) Seller shall be responsible for the payment of all charges that result from any change in any applicable law that occurs after the Effective Date that imposes new or additional (i) obligations on a Party to obtain or provide transmission service or ancillary services prior to the Delivery Point, or (ii) variable integration charges or imbalance costs, fees, penalties, or expenses, or provides benefits that, in the case of either clauses (i) or (ii), are imposed, assessed or credited by the transmission provider based on the impacts of energy generated by variable generation projects generally (collectively, the "Variable Integration Costs"). Seller shall be responsible for all Variable Integration Costs, irrespective of whether the Variable Integration Costs are assessed against Seller or Buyer and, to the extent any Variable Integration Costs are incurred by Buyer, Seller shall promptly reimburse Buyer for such Variable Integration Costs.

Q. HOW DOES SCE&G PROPOSE TO RECOVERY THESE NEWLY QUANTIFIED SYSTEM COSTS AS A RESULT OF THE SELLER'S SOLAR GENERATORS?

A. With the calculation of these costs complete and fully represented in Company Witness Dr. Matthew Tanner's Exhibit No. __ (MWT-2), SCE&G intends to apply the variable integration costs to those Sellers with variable integration costs language in their PPAs. This recovery will be assessed as a monthly charge ("Variable Integration Charge") that will be ultimately dependent

on the Seller's actual megawatt-hour ("MWh") production. This charge will be prospective and commence the billing month corresponding to the effective date of the Commission's Order in this proceeding. For these PPAs, the Variable Integration Charge rate will be based on the value in the Rate PR-2 Solar Power Production tariff as represented in Company Witness Allen Rooks' Exhibit No. __ (AWR-16). Once set, this rate will not change for a currently executed PPA, whether the solar generator is already interconnected or still awaiting completion of construction, and will continue until the term of the PPA expires. This rate will also be the charge included for all solar generators entering into new or renewing PPAs until the Commission approves a new Rate PR-2 Variable Integration Charge rate. Each year as part of the Company's fuel proceeding, the Rate PR-2 Variable Integration Charge rate will be reevaluated and updated as necessary. Any update to the Variable Integration Charge rate will be applicable for new or renewed PPAs executed after the effective date of the update.

The Variable Integration Charge has also been included in the Rate PR-1 Small Power Production, Cogeneration tariff as represented in Company Witness Allen Rooks' Exhibit No. __ (AWR-14). This billing line item charge would be prospective and commence the billing month of the Commission's Order in this proceeding. Rate PR-1 is updated annually through the Company's fuel proceedings and as such, will change in terms of the Energy and Capacity Credits as well as the Variable Integration Charge at that time if necessary.

Q. HAS SCE&G EXECUTED PPAs THAT DO NOT CONTAIN THE VARIABLE INTEGRATION COST LANGUAGE DESCRIBED ABOVE?

A. Yes.

Q. DOES SCE&G PLAN TO AMEND ANY OF THESE PPAs TO INLCUDE THE VARIABLE INTEGRATION COST LANGUAGE?

A. No. However, as I testified earlier, SCE&G does intend to include this language in any new or renewed PPA on a going forward basis.

UTILITY INVESTMENT DER PROGRAMS

Q. CONSIDERING THAT BOTH THE 1% CUSTOMER-SCALE AND 1% UTILITY-SCALE GOALS HAVE BEEN MET, IS SCE&G EXPLORING MOVING FORWARD WITH THE ADDITIONAL 1% UTILITY-SCALE INVESTMENT CONTEMPLATED IN S.C. CODE ANN. § 58-39-130(D)?

A. Yes. In Docket No. 2018-2-E, SCE&G discussed its plans to issue RFPs for solar photovoltaic systems coupled with battery energy storage. Over the past year, the Company has gained valuable knowledge of solar generators' impact to SCE&G's grid through firsthand experience. As a result, SCE&G has determined that focusing its efforts on evaluating other distributed energy resource technologies that further enable a more resilient and flexible grid is the appropriate path for the 1% utility-scale investment contemplated in S.C. Code Ann. § 58-39-130(D) at this time.

Q. WHAT DISTRIBUTED ENERGY RESOURCE TECHNOLOGIES DOES THE COMPANY CONSIDER AS ENABLING A MORE RESILIENT AND FLEXIBLE GRID?

A. SCE&G anticipates that battery energy storage systems may provide the Company with the ability to periodically store energy, and then dispatch that energy from the batteries when it is needed on the system. These situations occur today when the non-dispatchable, non-schedulable solar power production is high but system loads are low. Battery energy storage systems may be deployed to store mid-day solar and serve late evening summer peaks that are experienced outside of the solar profile. Similarly, battery energy storage systems may store overnight, baseload generation to serve the early morning winter peaks.

Battery energy storage systems in combination with certain Commercial and Industrial customers may also provide useful insight to customer solutions that not only minimize costs for these specific customers, but also the costs for the overall system in avoiding certain periods when both energy and demand are higher. These customer-sited energy storage solutions may act similar to a demand response program, by being called upon when needed and reducing the appearance of system load but allowing operations at the customer's site to continue unimpeded.

And finally, battery energy storage systems may provide additional voltage and reactive power regulation options, frequency regulation, and the smoothing of intermittent solar generation throughout the solar profile. For the collective reasons

mentioned above, SCE&G has begun to model battery energy storage in its Integrated Resource Planning.

SCE&G is also exploring electric vehicle charging programs. As the global automotive movement continues towards all electric vehicle fleets, it is becoming increasingly important to prepare for electric vehicle charging programs for customers. Just as the battery energy storage systems may mitigate peaks in power needs and prices, thoughtful designs in electric vehicle charging programs may provide solutions to enhance grid operations.

Although the programs mentioned above have not yet been finalized, SCE&G anticipates issuing RFPs for these types of distributed energy resource solutions, and expects that they will bring competitive pricing, industry insight and best practices for their deployments. If SCE&G identifies competitive projects that provide system or customer benefits, SCE&G anticipates applying to the Commission for approval to move forward with the contracts and deployment. The data gained from such systems will enable the Company to understand technology solutions to facilitate the integration of clean, intermittent generators at the lowest cost possible, as well as methods to reduce overall system costs.

Q. ARE THERE ANY OTHER PROGRAMS SCE&G IS EXPLORING WITH RESPECT TO THE ADDITIONAL 1% UTILITY-SCALE INVESTMENT?

A. Yes. As also discussed in Docket No. 2018-2-E, the Lake Murray Training Center is located at the Saluda Hydro Generating Station. This facility is used to

train utility linemen and substation electricians. In 2015 a coal ash landfill was capped adjacent to this facility and the topmost portion was prepped for a potential solar farm. This site is ideal because of its shared footprint with a local substation and training facilities, as well as its highly visible location for pedestrians and motorists crossing the Lake Murray Dam each day. This high amount of visibility will help promote solar awareness among the general public. In conjunction with a possible solar farm, SCE&G is considering a microgrid integrating advanced technologies such as lithium ion battery energy storage, fuel cells and flow batteries. As defined by the U.S. Department of Energy Microgrid Exchange Group, "[a] microgrid is a group of interconnected loads and distributed energy resources within clearly defined electrical boundaries that acts as a single controllable entity with respect to the grid. A microgrid can connect or disconnect from the grid to enable it to operate in both grid-connected or island mode." Microgrid capabilities include circuit-level grid support, power quality, reliability and resiliency, and temporary back-up energy supply.

A solar farm at the Lake Murray site would work in concert with SCE&G's distribution system to provide a replicable resilient electric power microgrid and give utility engineers and workers a system on which to study and train. Through an RFP for the first stage of a solar farm, battery energy storage, microgrid and emerging technologies site prep, SCE&G expects to receive not only competitive pricing, but also industry insight into best practices for microgrid deployment directly on its system. If SCE&G identifies competitive projects that provide

system benefits, SCE&G anticipates applying to the Commission for approval to move forward with the contracts and deployment.

UPDATE ON DEMAND SIDE MANAGEMENT POTENTIAL STUDY

Q. PLEASE DESCRIBE THE COMPANY'S EFFORTS IN RESPONSE TO THE COMMISSION'S REQUIREMENT IN ORDER NO. 2018-322(A), ISSUED IN MAY 2018, THAT "SCE&G SHALL INVESTIGATE AND IMPLEMENT ECONOMIC DEMAND SIDE MANAGEMENT AND ENERGY EFFICIENCY PROGRAMS WITH AN EMPHASIS ON DECREASING THE NEWLY DEVELOPED WINTER PEAK"?

A. In June 2018, SCE&G began the process of an exhaustive demand side management potential study, which is being conducted by ICF International and Opinion Dynamics Corporation. In addition to ascertaining what changes and improvements are warranted in its current energy efficiency programs, the study is expected to report on demand response programs that could impact the winter peak. The results of those studies are planned to be presented to the SCE&G Energy Efficiency Advisory Group and this Commission by the end of June 2019.

CONCLUSION

Q. WHAT IS SCE&G REQUESTING OF THE COMMISSION IN THIS PROCEEDING?

A. SCE&G respectfully requests that the Commission approve the Company's costs incurred in providing DER programs during the Review Period as being reasonable and prudent and find that the Company's fuel purchasing practices were reasonable and prudent for the Review Period.

Q. DOES THIS CONCLUDE YOUR DIRECT TESTIMONY?

A. Yes.